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July 19, 1978

Allen Shelley, Director of Public Works

Norman H. Lougee, Water Division Engineer

FAIRCHILD CHEMICAL SPILL--~~CHRONOLOGY OF EVENTS~~

The following report covers the significant events of cleanup of the recent chemical spill originating at the Fairchild semiconductor plant. The report is written to give the chronological order of events, to express my own and Jerry Paulk's observations, and to make recommendations for prevention and handling of future chemical spills.

CHRONOLOGY OF EVENTS5-8-78

State Game Warden Bill Hoffman called Chuck Hagood in the morning for storm drain information. He said a fish kill had occurred in Stevens Creek. <sup>Chuck</sup> He set up a meeting with Jerry Paulk and me for 1 p.m. but <sup>Bill Hoffman</sup> instead came to City Hall during the lunch hour and picked up storm drain maps.

After lunch, <sup>Sind</sup> Jerry ~~met~~ Bill and Karen Hamilton of Fish and Game and Bill Mackey of the Regional Water Quality Control Board at the east end of L'Avenida Avenue. Jerry called in Hank Hermon and all five followed the high-pH pollution up the

81" storm drain from Stevens Creek to the Fairchild Plant Building 9 off National Avenue, ~~by pulling up~~ <sup>were pulled up</sup> samples of storm water <sup>manhole</sup> at each <sup>the</sup> manway and ~~checking~~ <sup>was checked</sup> pH of the water with litmus paper. Figure 1 shows the area involved.

High-pH readings extended to the first <sup>manhole</sup> manway on National Avenue south of Fairchild Drive, then low pH readings were found in the next few <sup>manholes</sup> manways on National Avenue, then puddles with very high pH were found at Building 9. Additional pH readings on Fairchild Drive at the Testing and Controls driveway and on Clyde Avenue at the Pacific Ready-Mix Plant showed low pH.

After dinner, I met with Jerry, Bill Mackey, Bill Hoffman, and Dave Olds, <sup>Environmental Coordinator</sup> of Fairchild, at the area referred to hereafter as Drop 2 of Stevens Creek, located about 700' south of L'Avenida Avenue (see Figure 2). Bill Mackey said that so far, Fairchild was not accepting responsibility for cleanup of the pollution, and he seemed frustrated at being unable to reach a level of management that could respond promptly.

Dave Olds, however, acting on <sup>behalf of Fairchild</sup> ~~his own as Environmental Coordinator for Fairchild~~, constructed a rock-and-gravel dike at the outlet to the pool below Drop 2 to prevent further downstream movement of the pollution.

In the absence of a commitment from Fairchild to clean up the spill and resultant pollution, I offered to have City forces build a sandbag dike across Stevens Creek at the end of L'Avenida Avenue where polluted creek water could be pumped into the Sanitary Sewer for dilution in the Mountain View system and ~~ultimate~~ <sup>ultimate</sup> treatment at the Palo Alto Water Quality Control Plant.

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Jerry Paulk assembled a crew and equipment, and the sandbag dike was installed by 10 p.m. During the work, the Fire Department command car stood by and provided phone and radio communications and informed Ralph Jaeck, Assistant City Manager, of progress. The Fire Department also provided floodlighting.

After completion of the dike, I met with Dave Olds and Jerry and planned the next day's activities, then informed Allen Shelley, Director of Public Works, who was at the City Council meeting, of the spill, our efforts thus far, and plans for the next day.

#### 5-9-78

Waste Water Division crews installed a gasoline-driven pump at the end of L'Avenida Avenue and began pumping water from Stevens Creek to the sanitary sewer system. This was continued until about noon, when it became obvious that the lift station at Space Park Way could not handle the full flow of the pump.

About 9 a.m., Ray Phillips of Fairchild called to say that, while Fairchild was not admitting guilt regarding the spill, corporate approval had been given to participate in the cleanup operation to whatever extent was necessary. I informed him that the spill had been contained and that workers were needed to stir up the floc caused by the spill that had settled on the creek bottom so that it could be pumped out by our pumps. He said that he would assemble the workers.

About 10 a.m., Jerry received a call from Dave Olds reporting a spill of perhaps as much as 2,500 gallons of hydrochloric acid from Fairchild's neutralization system into the sanitary sewer. Jerry informed the Palo Alto Water Quality Control Plant, Ash Chapman of Palo Alto, our sewage pump station, and the Fire

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Department of the spill, then dispatched Hank Hermoneto investigate the spill and take pH readings. Hank reported back that he found high pH readings in the sanitary sewer. This was due, we found later, to a discharge of sodium hydroxide made by Dave Olds in an attempt to neutralize the acid spilled earlier. 4

By early afternoon, it was obvious that the floc deposits <sup>in the creek</sup> were too extensive and settled too quickly to allow sweeping of the material downstream to our pump, and this attempt was abandoned. Fairchild then brought in nine vacuum trucks to suck the material from the creek bottom. The plan was to discharge creek water to the sanitary sewer, but Jerry would not allow this after seeing the first truck suck a large amount of stream gravel along with the deposits into the tank. Jerry and I then looked for a suitable area to discharge the trucks where the gravel would settle out <sup>and</sup> where the polluted water could be pumped slowly into the sanitary <sup>then</sup> sewer <sup>system</sup>. A suitable depression was found adjacent to the sewage pump station, and the truckers were so informed. Each of the nine trucks discharged two loads to the area by dusk.

In the early evening, Ray Phillips informed me that he had hired IT Corporation to take over cleanup operation starting the next morning and introduced me to Phil Johnson and Don Tenconi of that company, who described that company's capabilities and convinced me that they could handle the work.

Bill Hoffman expressed dissatisfaction with the cleanup operations thus far and was hopeful that IT could accelerate the cleanup.

This spill was apparently neutralized by the high volume of sewage that <sup>it</sup> mixed with and no evidence was of the spill was observed at Mountain View's sewage pump station or at the treatment plant in Palo Alto.

During the afternoon, I wrote an information memo to the City Councilmembers to inform them of the spill. The press had been on hand in the morning, and the incident was expected to be described in the evening news. This memo was distributed to the Councilmembers in the early evening.

5-10-78

Ray Phillips called about 8:30 a.m. to say that Fairchild and IT had decided to clean the storm drain first, so they set up at Fairchild and National. He asked for assistance, and Jerry dispatched a crew to assist. They sandbagged the storm drain below National Avenue and brought fresh water from the creek at L'Avenida and discharged this water into the manhole above National Avenue then pumped the water out again at National and hauled this water to <sup>the depression at</sup> the sewage pump station. In the afternoon, the depression had filled sufficiently, and the pump was started to discharge this water into the sanitary sewer system at the sewage pump station. The work continued on Fairchild Drive until dusk.

About 11 a.m., Brad Martin and I walked the length of Stevens Creek that had been polluted, and Brad photographed the area.

At 1 p.m., I attended a meeting at Fairchild attended by Ken Burger of the State Regional Water Quality Control Board, Bill Hoffman and Tom Kasnick of the Fish and Game Department, Ray Phillips, Dave Olds, Justin Beck, and <sup>Bernie Yurash</sup> ~~Ray Alhona~~ of Fairchild, and Phil Johnson of IT Corporation. Considerable discussion concerning whether Fairchild was to blame ensued. After some time, Chris Mistry of Fairchild was called in, and he told us that he had seen the trucker from Giacomozzi Trucking Company discharging a clear liquid to the storm drain grate outside Fairchild's

water treatment plant. The trucker told Chris he was discharging water. This was about 1:30 p.m. on Friday, May 5, 1978. About 3:30 p.m. on that day, Chris Mistry noticed that cardboard that had blown into a puddle near the storm drain was being eaten away. He checked the pH of the puddles and found the reading to be over 13. Chris said that Ray Alhona had witnessed the litmus paper check of pH in the puddles. After the meeting, we toured the water plant and saw that a sodium hydroxide tank had no top hatch and the gauge glass was broken. The tank had obviously overflowed; white powder streaks were all over the tank, showing how caustic had flowed out from the top.

### *Mosquito Abatement*

After the meeting, I drove to the County Health Department Facility on Moffett Boulevard behind the PG&E substation and found the Streets Division grader clearing a road into the end of the storm drain at Stevens Creek. *with a ↓ to provide access for I. T. vacuum trucks.*

5-11-78

IT Corporation continued on Fairchild Drive, cleaning the storm drain. In the afternoon, Dave Olds, Bernie Yurash, Jerry, Hank, and I went around the industrial area inspecting ~~the~~ storm drains and taking samples. Notes were written on the storm drain 701 maps giving time, pH reading, and any other pertinent information.

IT took 16 loads of high-pH water from the storm drain to the pond at the sewage pump station, until dusk.

5-12-78

IT continued on the Fairchild storm drain and ~~took~~ took 10 loads to the sewage pump station.

At 4 p.m., I met with Ray Phillips, Lee Neal, Ken Rohner, Justin Beck, and Bernie Yurash of Fairchild, Fred Orman of IT, and Bill Hoffman and Karen Hamilton of Fish and Game. Fred told of the work that IT had done on the storm drain and said that the drain cleanup was completed and that on the next morning, IT would start cleaning up Stevens Creek where the floc had settled. After some discussion as to whether work should continue on Saturday and Sunday at overtime rates, Bill Hoffman telephoned Ken Burger and returned with the conclusion that overtime work was necessary.

5-13-78

(See Fig 3)

IT crews started at the storm drain outlet and began cleaning the creek bottom. This was accomplished by flushing the creekbed with high-pressure hoses and then pumping this water out with vacuum trucks. This water was taken to the pond at the sewage pump station. The crews completed the section from the storm drain outlet to the ~~drop~~<sup>Drop 1</sup> at the end of Macon Avenue just downstream from Highway 101. Fifteen truckloads of water were taken to the sewage pump station during the day. In the afternoon, I collected samples of floc from the creek below Macon Avenue where the floc had settled to a depth of about 3".

5-14-78

IT crews started at Drop 1 and worked downstream during the morning. About 1 p.m., the crews shifted to the section below the pool at Drop 2 and completed that section, then moved back upstream and worked on the creek between Drop 1 and Drop 2. During the afternoon, vacuum trucks pumped water from the pool, decanting the water



*This water was discharged back to the creek below the pool.*

and leaving ~~most~~ of the floc still in the gravel around the pool. When the creek had been cleaned above Drop 2, the small amount of water flowing in the creek was pumped to the downstream side of the ~~still contaminated~~ pool. When the pool had been emptied out, then the gravel was thoroughly flushed with high-pressure hose streams, and this water was pumped to the vacuum trucks and hauled away. Sixteen loads were taken to the sewage pump station. The work on cleaning this portion of the creek was completed about 8:30 p.m.

#### 5-15-78

About 8:30 a.m., Jerry Paulk and I walked the length of Stevens Creek that had been cleaned. The creek appeared in excellent condition. About 2 p.m., <sup>Jerry and</sup> I met with Dave Olds and Steve Allen of Fairchild. Steve took several pictures of the creek.

#### 5-16-78

About 5 p.m., I met with Jerry Paulk, Ken Burger, Dave Olds, and Justin Beck at Denny's Restaurant on Leong Drive. Ken Burger explained that he had taken samples in Stevens Creek and found pH readings of between 10 and 11 in different pools as far downstream as Drop 1. He also found a pH of 11 at the last manhole on the 81" storm drain. Dave Olds called Fred Orman of IT Corporation and asked him to meet us. We then took pH readings at Leong and Evandale, where the pH was 8.7; ~~then~~ at Evandale east of Emily, where the pH was 8.6; and at Evandale and Tyrella, where the pH was 8.2. When Fred Orman arrived, Jerry, Dave Olds, and Fred added sandbags to the storm drain outlet at Stevens Creek. About 7:30, I called Allen Shelley and asked for permission to walk through the storm drain from Stevens Creek to Fairchild with representatives of Fairchild and IT in the morning, *to determine the extent of cleanup still needed.*

5-17-78

Ray Phillips, Chris Mistry, Lee Neal, Fred Orman, Jerry Paulk, and I walked inside the storm drain from Stevens Creek to Ellis Avenue, <sup>using litmus paper</sup> pH readings were taken, and were high, 10-11, between Stevens Creek and Leong Drive when the ~~silt that had~~ <sup>silt</sup> accumulated in the drain was stirred up. The pH was neutral from Leong Drive to Whisman Road, <sup>where there was very little silt.</sup> Above Whisman Road, pockets of very high pH, 13+, were found <sup>in the accumulated sand and silt.</sup> In the section from Stevens Creek to Leong Drive, some floc was evident on top of the silt. Above Leong Drive, <sup>were</sup> white lines ~~was~~ evident at the flow line on both sides of the drain, <sup>but no floc was found.</sup> On Ellis Street south of Fairchild Drive, the flow was clear, <sup>and</sup> There was no floc but some sand and silt, <sup>the</sup> pH was between 5 and 6. In the afternoon, pH readings were taken in Stevens Creek. At the sandbagged dike at the storm drain outlet, the pH was 11.2 on both sides of the dike. At 100' below the outlet, the pH was 10.8. Under the 101 bridge, the pH was 9.8. The pH was 9.4 below Route 101, and the pH in the pool below Drop 1 was 9.0.

At 5 p.m., I met with Chris Mistry, Ray Phillips, Lee Neal, Justin Beck, Ken Rohner, and Bob Bos<sup>ick</sup> of Fairchild, Phil Johnson and Fred Orman of IT, Ken Burger of the Regional Board, Bill Hoffman of Fish and Game, and Jerry Paulk <sup>Danny's</sup> at Danny's Restaurant on Leong Drive. At this meeting, Fairchild agreed to continue with the storm drain cleanup until the pH was acceptable to Ken Burger of the Regional Board.

After this meeting, Jerry Paulk and I met with Bill Hoffman and Ken Burger and toured the water treatment facilities at Fairchild once again. On this tour, a hole was observed at the bottom of the dike surrounding the sodium hydroxide tank. An eyewash fountain in front of this hole was operated, and the <sup>water</sup> ~~flow~~ was observed <sup>flow northward</sup> to the edge of the concrete <sup>walkway,</sup> then drop about 3' to the pavement <sup>below which it extended</sup> ~~and then flow~~ out under the building side wall into the driveway outside.

5-18-78

wearing Scott Air Packs, and hip boots loaned by the City

A crew of Fairchild employees, started at Leong Drive about 10 a.m. and poured hydrochloric acid into the water in the storm drain and mixed this acid with the silt to neutralize the high pH. This work continued all morning and afternoon. In the late afternoon, Ken Burger and Bill Hoffman took pH readings at the storm drain outlet and found readings still on the order of pH 10. This was in contrast to a pH of 8 to 9 using litmus paper. Several fish were collected from the County Mosquito Abatement Facility and were placed in the water in the storm drain. These fish showed signs of distress within minutes, and within one hour, all of the fish were dead. Fairchild then resumed adding more acid to the water in the storm drain and continued until about 10 p.m., when a tank truck with muriatic acid arrived and put 100 gallons into each of the storm drain manholes at Leong Drive, at the Country Inn, and behind the Mosquito Abatement Facility. The Fairchild crew then entered the storm drain to mix the acid and continued until about 1:30 a.m.

5-19-78

The Fairchild crew took samples from Leong Drive to Stevens Creek and analyzed them for pH using Fairchild's pH meter. Some acid was carried into sections where pockets of high pH still existed. In the afternoon, the pH was down to 6.5 throughout the entire section. Ken Burger arrived about 2:45 and entered the storm drain and took pH readings for the entire length from Stevens Creek to Leong Drive. At about 4 p.m., he approved that section. He then took pH readings in Stevens Creek as far as Drop 1 and approved this section also.

5-22-78

A Fairchild crew entered the storm drain at Fairchild Drive and National Avenue and added acid to the water and sediment in the drain from the Testing and Controls driveway to the driveway for Fairchild Building No. 4. In the afternoon, - it was apparent that too much acid had been used and several hydrants were opened to add water to the storm drain to ~~raise the pH~~ *dilute the acid and raise the pH.*

5-23-78

pH readings in the morning were from 8.9 to 9.7, and so a Fairchild crew again entered the storm drain and added more acid. In the afternoon, the pH was about 2.0 in many parts of the storm drain and again water was added to bring the pH up. About 4:30 p.m., Manny Herrero and I opened a hydrant on Clyde Court and discharged about 700 gallons per minute for about 20 minutes into the storm drain on Clyde Court which leads to Clyde Avenue and then to Fairchild Drive. *to assure that no acid was left in the drain which could damage the pipe.*

5-24-78

Ken Burger arrived about 8:40 a.m., and he and Jerry went into the storm drain at National Avenue with Scott Air <sup>Pack</sup> ~~pack~~. The pH was between 10 and 11 when the bottom sediments were stirred up. They went upstream about 50' and then came out. Ken Burger said that he could not accept the storm drain and that additional cleanup was required.

After a long discussion about how far Fairchild should go in cleanup, additional samples were taken between 10:15 and 11:15 a.m. at Testing and Controls (pH 8.4), at National Avenue (pH 10 to 11), at Fairchild No. 4 (pH 8.9), at Leong Drive (pH 8.0), and at the Country Inn (pH 7.8). At 11:30, Ken Burger and I took pH readings at all manholes with water in them on National Avenue. The pH readings were between 7 and 8. At about 12 noon, a sample was taken on Clyde Avenue at the Pacific Ready-Mix Plant. The pH was 8.2.

In the afternoon, the City installed a pump at National Avenue and Fairchild and pumped water from the storm drain to the sanitary sewer. At the same time, water was discharged from a hydrant on Fairchild Drive east of the Testing and Controls Driveway. This was continued until 3:30 p.m.

#### 5-25-78

The hydroflush truck was set up at Fairchild and National Avenue, and the hose nozzle was extended to the next manhole to the east. A piece of 2 1/2" pipe was installed over the end of the hose to weight the nozzle down, and then the nozzle was pressurized. The nozzle jets appeared to do a good scouring of the sediment and was continued for the rest of the morning.

In the afternoon, the hydroflusher was set up at the driveway to Building No. 4, and the nozzle was extended to National Avenue. At 3:25 p.m., the pH at National Avenue was 9.8 when the sediment was stirred. At 4:20 p.m. at Fairchild Building No. 4, the pH was 8.8 when the sediment was stirred up.

#### 5-26-78

The hydroflush unit was operated all day on Fairchild Drive. At 2:20 p.m., the pH at Fairchild and National was 9.0.

5-30-78

Flushing of the storm drain was resumed and continued until late morning, when Ken Burger arrived and inspected the storm drain. Ken found pockets of sediment which still had high pH readings and rejected the work once again.

I collected a sample of floc from Fairchild's water treatment plant clarifier. Fairchild's water plant operator also collected a sample and then concentrated the floc by letting the floc settle, decanting the water, and then adding more water from the clarifier. These samples were taken to the Palo Alto Water Quality Control Plant laboratory.

6-1-78

I met with Lee Neal, Bernie Yurash and Fred Orman to discuss methods to remove the sediment from the storm drain. It was decided that IT Corporation would bring in their "supersucker" vacuum truck and with the aid of a crew inside the storm drain would suck the remaining sediment out of the storm drain. IT arrived in the afternoon and did preliminary work using a standard vacuum truck.

6-2-78

IT continued with a standard vacuum truck in the morning and the supersucker truck in the afternoon. The sediment was hauled to the field behind Building 19. After 5 p.m., the truck was stored at the City's Operations Center.

6-5-78

IT continued work on the storm drain, assisted by a City crew that pumped water from the storm drain to the sanitary sewer.

6-6-78

IT continued and completed the work in the late afternoon.

6-8-78

Ken Burger arrived about 11 a.m. and entered the storm drain at National Avenue and walked upstream to Testing and Control's driveway and then downstream to Whisman Road and then came out at Building No. 4. All pH measurements taken were acceptable, and the cleanup work was finally accepted.

### Conclusions

In spite of the long period of time involved in the cleanup of the storm drain and Stevens Creek, the work progressed in a <sup>fairly</sup> straightforward manner. A fine spirit of cooperation between Fairchild and the City continued throughout the entire work.

In retrospect, the problem was one that should have been handled completely by professionals experienced in spill cleanup operations. IT Corporation demonstrated their ability on this project. The company had the proper equipment and trained personnel. At times, however, the <sup>work was slower than I think it should</sup> ~~workers appeared to have little motivation to complete the work~~ have been and always took longer than IT said it would.

Because cleanup work was unfamiliar to both the City and to Fairchild, considerable experimentation occurred that added to the cost of cleanup. The work also presented hazards that were not fully realized at the time.

During Fairchild's work in the storm drain near National Avenue, a landscape company sprayed paraquat on nearby ivy plants, and some of this material entered the

storm drain and drove the workers out. Some tightness in the workers' chests was experienced.

Fairchild workers wore rubber hip boots loaned to them by the City. After completion of the work, these boots disintegrated. ~~During the work,~~ <sup>Wearing their boots,</sup> these workers walked in acid with pH readings of 2 and below and caustic with pH readings of 12 and higher. Had the boots disintegrated faster, severe and perhaps fatal injuries could have occurred.

On several occasions, Fairchild workers were exposed to acid fumes without being protected by vinyl suits. In at least one instance, a worker breathed acid fumes when he removed his Scott Air-Pak mask.

During the storm drain walk-through, the above-ground crew had only one manhole open at a time--the one ahead of the crew inside the pipe. No forced ventilation was used, and on several occasions the low oxygen alarm sounded and a smell of kerosene, perhaps ~~a~~ a pesticide Recommendations base, was observed.

The following are recommendations for future handling of chemical spills which contaminate storm drains.

1. No one should be allowed into the storm drain after a spill except an experienced chemist wearing protective clothing and equipped with breathing apparatus.



2. As soon as the chemicals in the storm drain have been analyzed, vacuum trucks should be used to suck <sup>all of</sup> the material out and should haul this material to an approved disposal site.
3. City employees should enter storm drains in normal times only with forced-air ventilation and with acidproof and causticproof boots and gloves, *and should check pH frequently.*
4. If hazardous or unknown chemicals have been spilled, the Fire Department should be called immediately to determine the hazard *and* Chemtrec should be called if appropriate. If the chemical cannot be identified, IT Corporation should be called to make the identification. The material should be contained if possible. Dry material should be covered by a tarpaulin if there is danger of the material being blown away. Liquid material should be diked with soil or ~~solid~~ absorbent material. No attempt should be made to clean up or decontaminate the spill until positive identification of the material has been made.

Norman H. Lougee

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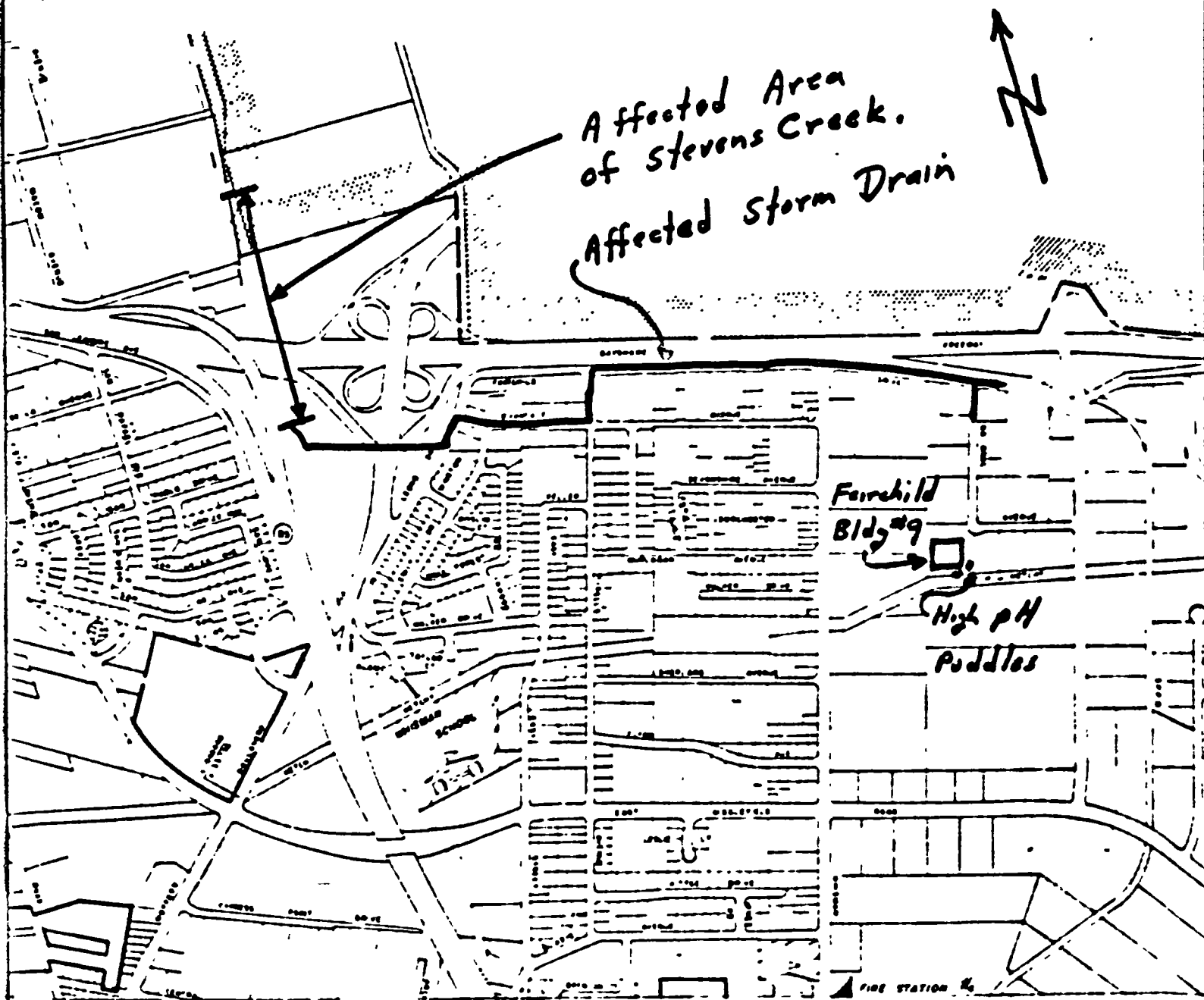


Fig 1

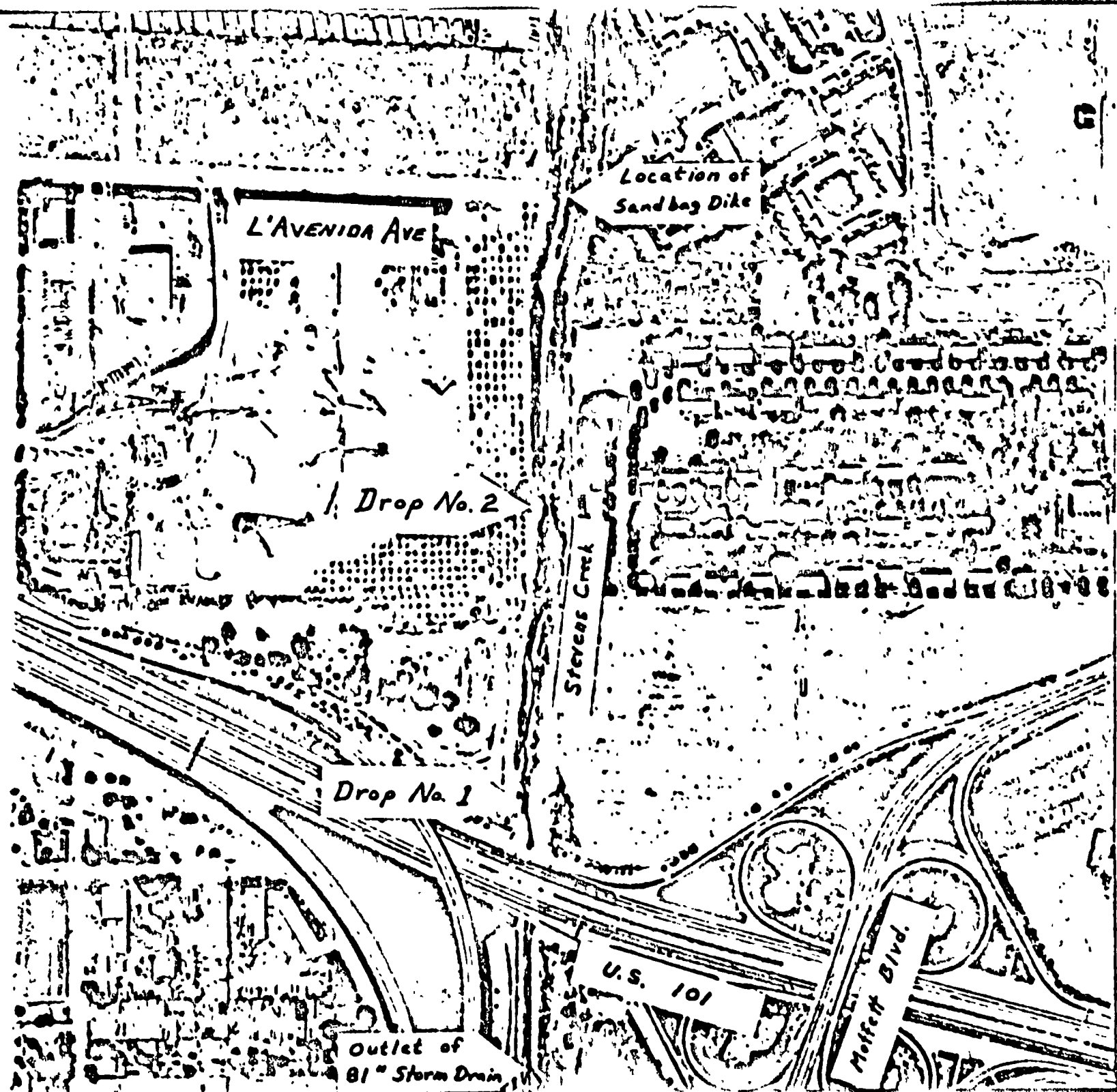
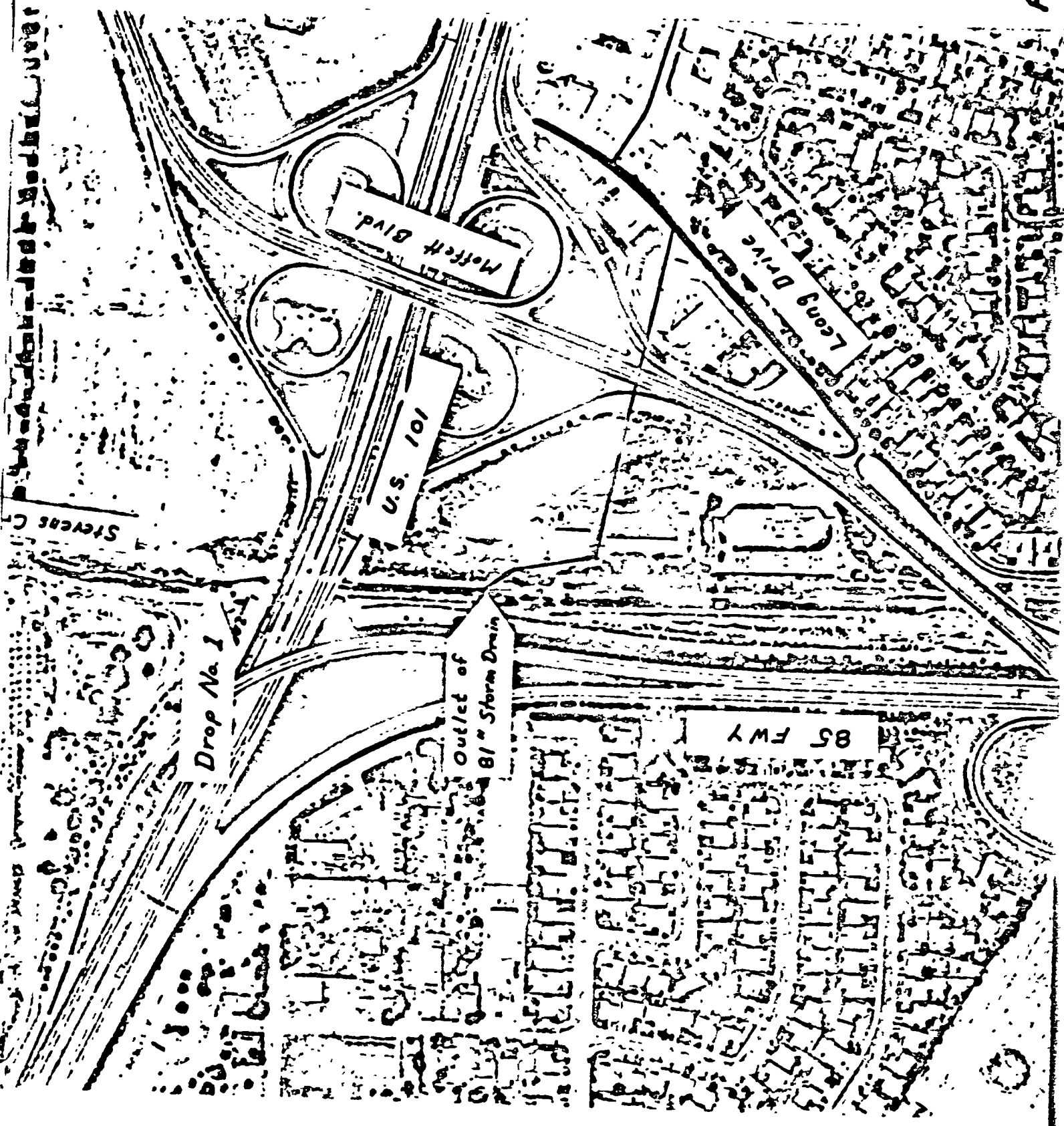


Fig 2



**FAIRCHILD**

SYSTEM TECH  
3500 DEER CREEK RD.  
PALO ALTO, CALIF.  
94304

DIODE PLANT  
4300 REDWOOD HWY.  
SAN RAFAEL, CALIF.  
94903

MOD/R & D  
4001 MIRANDA AVE.  
PALO ALTO, CALIF.  
94304

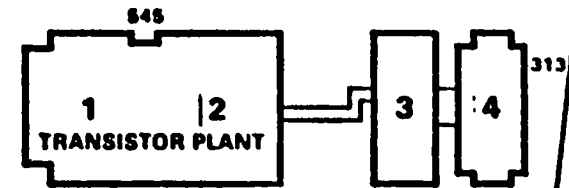
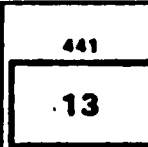
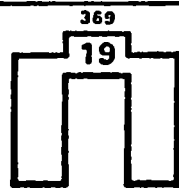
HEALDSBURG FACILITY  
33 HEALDSBURG AVE.  
HEALDSBURG, CALIF.  
95448

MIDDLEFIELD ROAD

WHISMAN ROAD

FAIRCHILD DRIVE

ELLIS STREET

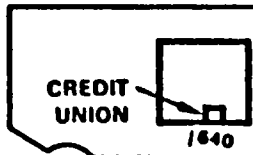


CHEM. MIX

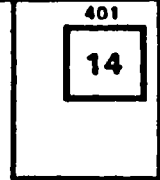
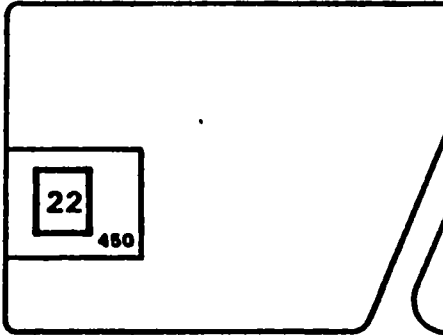
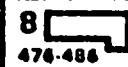
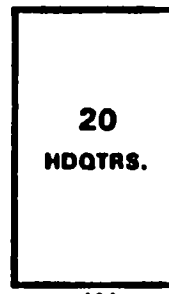
PLANT PROTECTION



D.I. PLANT



NATIONAL AVE.



FAIRCHILD MT. VIEW COMPLEX

SECURITY DEPARTMENT 10-18-73